Explore the Influence of Multiple Intelligences on Creativity through Instructional Leadership and Learning Style

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Abstract: The theory of multiple intelligences breaks the traditional concept of unitary intelligence and thinks that human intelligences exist in multiple forms, which has an important impact on the educational reform in western countries. This paper mainly studies the influence of multiple intelligences on creativity through instructional leadership and learning style. This paper designs a new teaching model based on multiple intelligences, and adopts this model to carry out teaching experiments. The data of test volumes before, during and after were analyzed by SPSS. The conclusion is: after the application of the theory of multiple intelligences, the scores of the experimental group have been improved to a certain extent in each dimension, while the improvement of each dimension of the control group is not large, the difference is obvious. It is proved that the multi-intelligence teaching method can significantly improve students' academic performance and innovation ability.

1. Introduction

With the traditional intelligence theory point of view, the person's intelligence is not complicated, the theory not only focuses on the development of the student language also focused on the development of mathematical logic intelligence, lead to the students' creativity and imagination is not rich, and unable to measure students' non-intelligence factors such as mood, emotion, attitude, also cannot describe student achievement in life, more can't explain the nature of intelligence, and social reality. Therefore, the theory of multiple intelligences has come into people's field of vision amid the strong doubts of many scholars. The theory of multiple intelligences is put forward by the world-famous professor Gardner. He believes that human intelligences can be divided into nine kinds, and these intelligences exist in different ways. Although no individual lacks any intelligence, they are not expressed in the same way and develop in different individuals [1]. In general, as long as the individual is given a certain amount of stimulus, and the individual continues to work hard, then it is much easier to improve his own intellectual development. Therefore, when teaching knowledge, teachers should try their best to

mobilize students' various intelligences, so as to promote the development of students' weak intelligences [2].

After the theory of multiple intelligences was put forward, it attracted the attention of people from all walks of life. After more than 30 years of development, there are a lot of research results. By presenting a large number of practical experience in front-line teaching, Hani summarized the methods and strategies of applying the theory of multiple intelligences to daily teaching practice, elaborated relevant issues such as educational equity and teaching evaluation, and reinterpreted the concept of multiple intelligences education, making it possible to apply the theory to practice [3]. Rulyansah describes the different activity styles of preschool children when dealing with specific tasks through relevant research on preschool children. On this basis, combined with the theory of multiple intelligence, she summarizes the evaluation methods and specific evaluation standards for preschool children, providing certain help for educators and researchers [4].

In this paper, based on the junior high school teaching, using the research achievements of predecessors about the theory of multiple intelligences, and according to the specific teaching goal of the new curriculum, and the characteristics of the junior high school courses, com'bined with the design of the teaching strategy, the theory of multiple intelligences and corresponds to the new classroom teaching mode, trying to develop a new type of classroom teaching mode based on the multiple intelligences, and detailed analysis summarized after the implementation of teaching.

2. Teaching and Learning Method under Multiple Intelligence

2.1 Background of the Emergence of Multiple Intelligences Theory

Since the 1980s, the world has initially shown the trend of political multi-polarization, economic globalization and cultural diversification. The world economy has also slowly prospered, bringing new hope to the education cause and at the same time putting forward higher requirements for education. Stimulated by the growing economic and technological strength of the Soviet Union, Japan and other countries, the United States felt a strong sense of crisis and constantly reformed education, but what remained unchanged was the pursuit of high quality and equal educational opportunities. The pursuit of equal educational opportunities is the most basic respect for human rights. The so-called "equality" not only refers to equal access to school, but also refers to equal opportunities for success. The success of education is closely related to the competitiveness of a country. This is an important premise for the emergence of the theory of multiple intelligences.

At the beginning of the 20th century, a test claimed to be able to measure intelligence was invented by a famous French psychologist. This test aims to measure a person's intelligence level to judge whether he or she is successful or not. People once believed in the results of this test, but its disadvantages became more and more obvious. It almost completely denies the value of students with low intelligence level, fetters their development, hinders their progress, and threatens the progress of education. This is the fundamental reason for the emergence of the theory of multiple intelligences.

In the context of this era, the fields of neuropsychology and brain science demonstrated the existence of multiple intelligences in the brain. At this time, Gardner was very interested in neurology research, focusing on the study of the human intelligence structure, and later served as the director of the "Zero Point Project" at Harvard University's School of Education, where he made some achievements in education and psychology. This greatly promoted the emergence of the theory of multiple intelligences.

2.2 Overview of Multiple Intelligences

(1) Multiple Intelligences Theory

The theory of multiple intelligences was proposed by Gardner in response to a single traditional theory of intelligence. This new theory holds that everyone is born with nine kinds of intelligence, as follows [5-6]:

Language intelligence mainly refers to an individual's ability to flexibly master language and characters. Simply put, it is the ability to listen, speak, read and write, which is manifested by the ability to flexibly and efficiently use language to describe events, express ideas and communicate with others.

Logical mathematical intelligence mainly refers to the ability of individuals to effectively use numbers and reason, which is manifested as liking to think in the way of reasoning, being good at finding problems and putting them into practice to seek answers, and exploring the rules and logical order of things.

Spatial intelligence mainly refers to the ability of individuals to use and operate the external space world pattern formed in their minds, which is manifested as being sensitive to structure, lines, shapes, colors and the spatial position relationship between them, and being able to accurately perceive the visual space and express what they perceive with planar or three-dimensional graphics.

Body-kinesthetic intelligence mainly refers to the ability of an individual to use the whole body or part of the body to solve problems or make products. It is shown as having a good control over his body, being fond of outdoor activities, being good at using body language to express his thoughts, and often using gestures or other body language to express when talking with others.

Musical intelligence mainly refers to an individual's ability to feel, distinguish, remember and express music. It is manifested as being sensitive to the tone, timbre, rhythm and melody of music, and being good at expressing one's own thoughts or emotions through composing, playing and singing.

Interpersonal intelligence mainly refers to the ability of individuals to effectively understand others and communicate with others, which is shown as being good at perceiving others' emotions and intentions and making appropriate responses, establishing close relationships with others and getting along well with them, and being good at mediating contradictory relationships.

Introspective intelligence mainly refers to the ability of individuals to correctly understand themselves and to have an insight into their emotions or intentions. They like to think about themselves alone, analyze their own advantages and disadvantages, know their own needs, and be good at planning their own life goals.

Natural intelligence mainly refers to an individual's ability to understand plants, animals and other natural environments. They are good at distinguishing the kinds of animals and plants, paying attention to the formation of clouds, minerals and stones, and liking to contact with nature.

Existential intelligence mainly refers to the ability of individuals to explore the meaning of life and the ultimate destiny of the physical and mental world. They like to think about the meaning of life and death, thinking about questions such as how human beings came into being and whether there is life on other planets.

(2) Multiple Intelligence Characteristics

The characteristics of multiple intelligences theory can be divided into four aspects, as follows [7-8]:

The universality of intelligence: human intelligence is innate, and no one is missing a certain kind of intelligence. There are certain differences in the performance of these intelligence, and the

combination forms of intelligence are also different, so the performance in different fields is also different.

Difference of intelligence: on the one hand, this difference is manifested as different intelligence development among different individuals. For example, boys have a better development of body kinesthetic intelligence, while girls have a better development of introspective intelligence. On the other hand, the individual's intelligence development is different, and everyone's intelligence has advantages and disadvantages. For example, a person's language intelligence is well developed and his music intelligence is poorly developed.

Development of intelligence: intelligence is not immutable, but can be developed in a specific cultural environment. If a person's performance of a certain intelligence is poor, it shows that his intelligence has not been fully developed, which can be compensated through education.

Compositions of intelligences: intelligences are not "independent", but are intricately combined in a variety of ways and at different levels of performance to form an inseparable whole, playing a role in combination.

2.3 Multiple Intelligent Teaching Mode

The unit review questions of "Answer Game" are divided into three forms: words, charts and applications. The difficulty of the questions is different to meet the needs of different students. Students will get different scores for different difficulty questions. Students will choose the topic first and use PPT to give examples in class.

Compared with the traditional review lesson, the review lesson of chemistry unit based on competition game has distinct uniqueness, such as group competition, individual competition, the form of reverse presentation from answer to question and so on. Based on these characteristics, this paper thinks that there are some concordant points between the chemistry "competition game" and the theory of multiple intelligences, and that the theory of multiple intelligences can be incorporated into the review class of the chemistry unit of "competition game" to realize the coordinated development of students' multiple intelligences.

Based on the theory of multiple intelligences, each person has nine kinds of intelligences, but due to the differences in genetic, environmental and other factors, each person's intelligence combination has its own characteristics [9]. In chemistry, different kinds of problems require different combinations of intelligence. According to different teaching contents and objectives, teachers create teaching methods suitable for each student's intelligence. In the teaching of chemistry "competition game", the methodical design of each course link contains the methods and means of teachers' intelligence development for students everywhere.

The diversity of intelligence indicates that teaching can make use of students' "superior intelligence" and mobilize and develop students' various intelligence. However, in the review class of chemistry "competition game" unit based on the theory of multiple intelligences, students' sense of active participation is strengthened in the form of games, and their interest in learning is strong, thus achieving the effect of getting twice the result with half the effort [10].

Through the interaction of students' intelligence, the "competition game" is a way of teaching through entertainment to realize the efficient learning in chemistry class. Due to the restriction of exam-oriented education, most of the review lessons of traditional chemistry unit are limited to scouring questions, and the teaching method is fixed, which seriously limits the intelligent development of students. Chemical "correct" game, the teacher in view of the weak spot in the learning process, students will learn classical examples, easy wrong topic and difficult point in the

process of combined with chemical game, recreation, construction application of reverse thinking and thinking, improve students' chemistry knowledge, improve the learning ability of students, committed to the purpose of students' lifelong development.

This teaching mode is interlinked with the process, and based on the intelligent characteristics of students, it carries out the chemistry review lesson. It not only has the advantage of teaching students in accordance with their aptitude, but also breaks the boring of traditional review through continuous independent innovation, discussion and error correction, and is committed to creating an interesting and in-depth review lesson.

2.4 Teaching Evaluation System Based on Multiple Intelligence

Teaching evaluation is a combination of teaching, learning and evaluation. According to the function of evaluation, it is divided into diagnostic evaluation, formative evaluation and summative evaluation. In line with the concept of "accomplishment is this", we should never deviate from the existing level of core accomplishment and the learning quality standard of this discipline to create training objectives. Based on daily performance, classroom examination, portfolio and other methods, it advocates the organic integration of self-evaluation, others' evaluation, and educator evaluation, so that it can evaluate students well and develop students' academic quality in all aspects.

(1) Diagnostic Evaluation

Usually before an activity, through diagnostic evaluation, students can know how well prepared they are and the reasons for their learning difficulties, so as to determine the appropriate treatment of students. For example, in this paper, the status quo of multiple intelligences and core literacy is investigated, and the dominant intelligence and core literacy of students are analyzed. In teaching design, the analysis of teaching materials should understand students' cognitive level and cognitive barrier points in advance, so as to give full play to students' subjectivity.

(2) Process Evaluation

Process-oriented evaluation is an interactive evaluation method based on the educatees in teaching. For example, the "Portfolio Evaluation" is conducive to the enhancement of students' cognitive quality, self-reflection and self-restraint to enrich the forms of assessment. The cultivation of learning quality is long-term, so the process evaluation is particularly important.

(3) Outcome Evaluation

Results evaluation covers a wide range of examinations at the end of the month, the semester and the end of the semester. Involved and covered aspects are very complete, can accurately judge the specific situation of students in a certain section of learning and how much knowledge they master.

Summative evaluation focuses on the results of teaching and learning, to make a comprehensive appraisal of the achievements of the evaluated, distinguish grades, evaluate the effectiveness of the whole teaching program, and reflect the knowledge system of the stage in a more comprehensive way. For example, in this paper, SPSS software is used to conduct statistical analysis of the collected data on the teaching practice effect and quantitative analysis to judge whether the core quality of innovation can be cultivated based on the theory of multiple intelligences.

3. Multiple Intelligent Teaching Experiment

3.1 Experiment Purpose

When the teaching mode of "competition game" based on the theory of multiple intelligences is applied to the specific teaching content, whether the teaching mode is in line with the reality, real and effective, so as to optimize the traditional review lesson and improve students' performance still needs to be tested in practice, which is the practical research purpose of this paper.

3.2 Experimental Method

In this experiment, two classes of a middle school in this city were selected, which were divided into experimental class and control class. The experimental class adopts the multi-intelligence teaching design for teaching, while the control class normally teaches without any other special treatment. The overall academic performance of the two classes is similar and they are taught by the same teacher. The teaching methods and progress of the two classes are the same.

3.3 Data Statistics

In this paper, the weekly test of two research classes before the implementation of the case was taken as the pre-test score, the weekly test after the implementation of the case was taken as the middle test, and the test after a week was taken as the post-test. The main content of the test tends to be innovative questions. At the same time, SPSS 22.0 software was used to comprehensively analyze the data information obtained, and t test was carried out. The t-test formula used in this paper is as follows:

$$t = \frac{\overline{X} - \mu}{\dfrac{\sigma X}{\sqrt{n}}} \tag{1}$$

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\dfrac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}} \tag{2}$$

$$t = \frac{\overline{d} - \mu_0}{s_d / \sqrt{n}} \tag{3}$$

4. Experimental Result

4.1 Comparison of Test Results

As shown in Figure 1, the average scores of the experimental class and the control class in the opening test (pre-test) were 78.47 and 79.02, which were almost the same. The standard deviations of the opening test (pre-test) of the experimental class and the control class are also very close. From the size of the standard deviations, it can be seen that the physics scores of the two classes are highly discrete and highly polarized. Stage after test (measurement), according to the experimental classes and that in comparative classes learning performance decline, mainly due to learn new knowledge, and the test subject is difficult, but the experimental class average score was slightly higher than that in comparative classes, experimental class standard deviation began to slightly less

than the standard deviation of that in comparative classes, the student performance has begun. The mid-term test (post-test) shows that the average score of the experimental class is significantly higher than that of the control class, and the variance of the experimental class is significantly smaller than that of the control class, which indicates that the performance of the students in the experimental class has significantly improved.
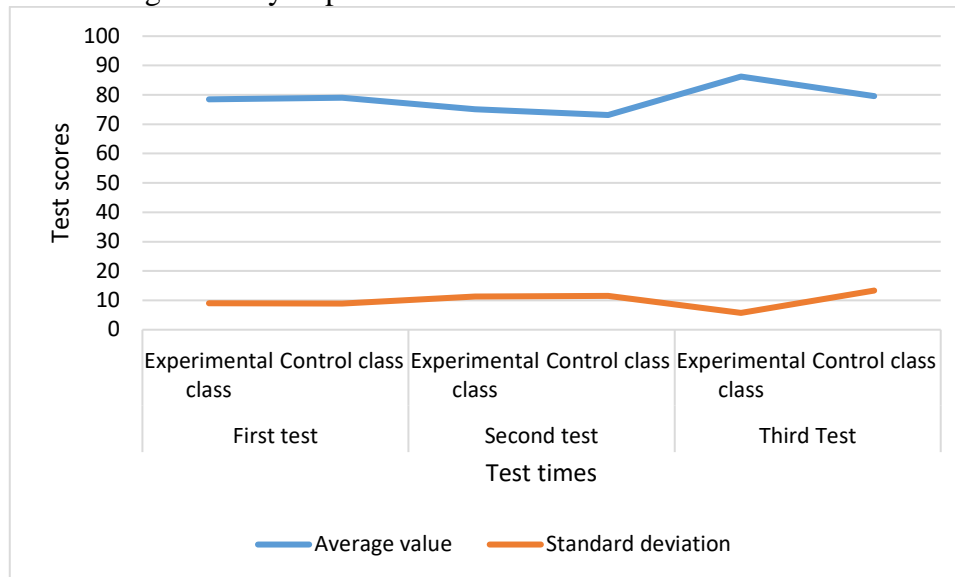

Figure1: Pre-middle and post-test scores of experimental class and control class were counted

4.2 T Test Results

Table1: Normal distribution test of sample scores

	Class	Kolmogorov-Smirnov	
		df	Sig
First test	Experimental class	23	.190
	Control class	25	.190
Second test	Experimental class	23	.190
	Control class	25	.190
Third Test	Experimental class	23	.148
	Control class	25	.096

As shown in Table 1, there are a total of 23 people in the experimental class and 25 people in the control class. After KS- test for normal distribution, Sig is greater than 0.05, indicating that the samples meet the characteristics of normal distribution and the data are suitable for independent sample t test.

As shown in Figure 2, the pre-test P value is 0.854 (greater than 0.05), and there is no significant difference between the results of the experimental class and the control class, which further proves that the starting point of the selected experimental samples is the same. The P value of the middle test is 0.638 (greater than 0.05), and there is still no significant difference between the experimental class and the control class. However, both the mean value and variance have changed, which shows that the experimental class has improved more than the control class. The post-test P value is 0.047 (less than 0.05), which indicates that the results of the experimental class and the control class are significant.
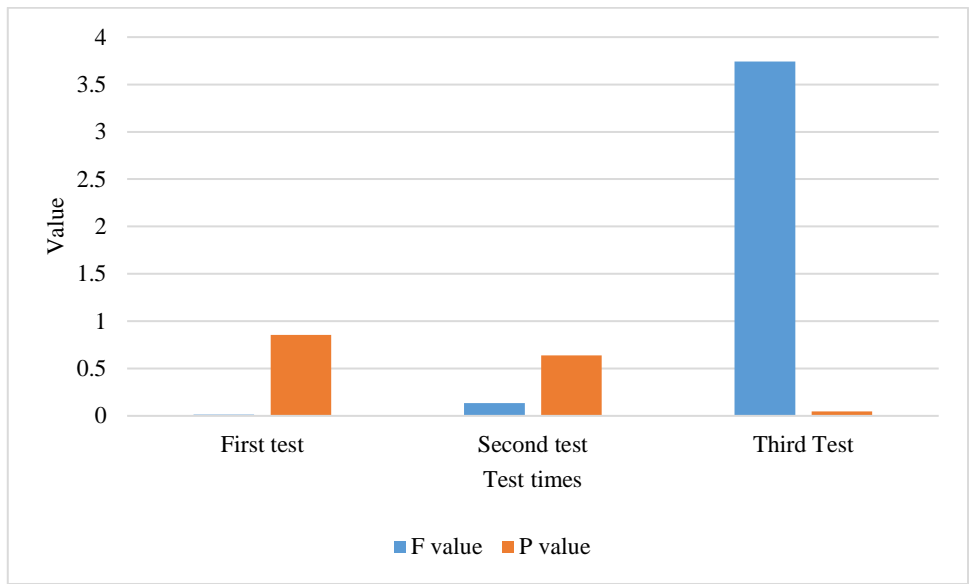
Figure 2: Independent sample t test of experimental class and control class

4.3 Innovation Core Literacy

According to the test content, this paper divides the core literacy of innovation into five parts, which are: macro and micro analysis, change and balance thinking, reasoning and model certification, scientific inquiry consciousness, and social responsibility. Mark the five parts of the appeal as A, B, C, D, and E, and list the statistical data.

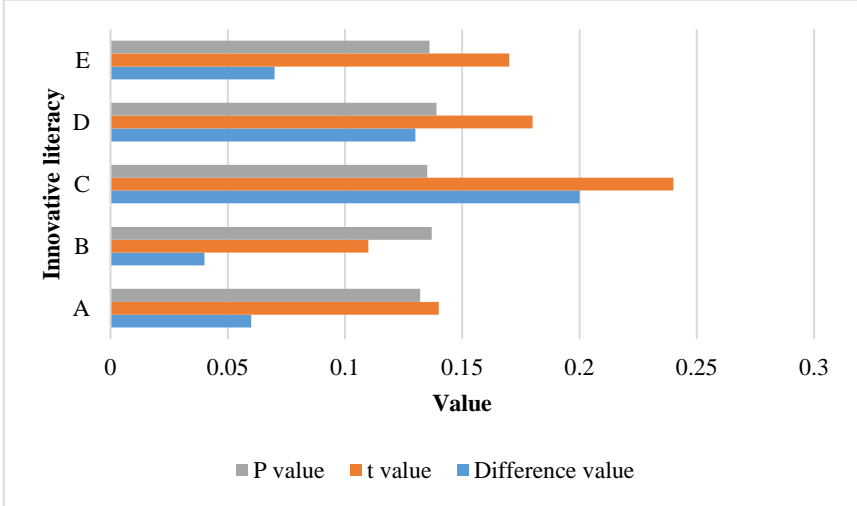(1) Statistical Results of Comparison Classes

Figure 3: Statistical results of comparison classes

As shown in Figure 3, the P values of all aspects before and after the control class experiment, >0.05, proved that there was no significant difference, as well as no significant difference in students' core literacy. It shows that the traditional teaching mode in the control class can not improve the core quality.

(2) Statistical Results of the Experimental Class

Table 2: Statistical results of the experimental class

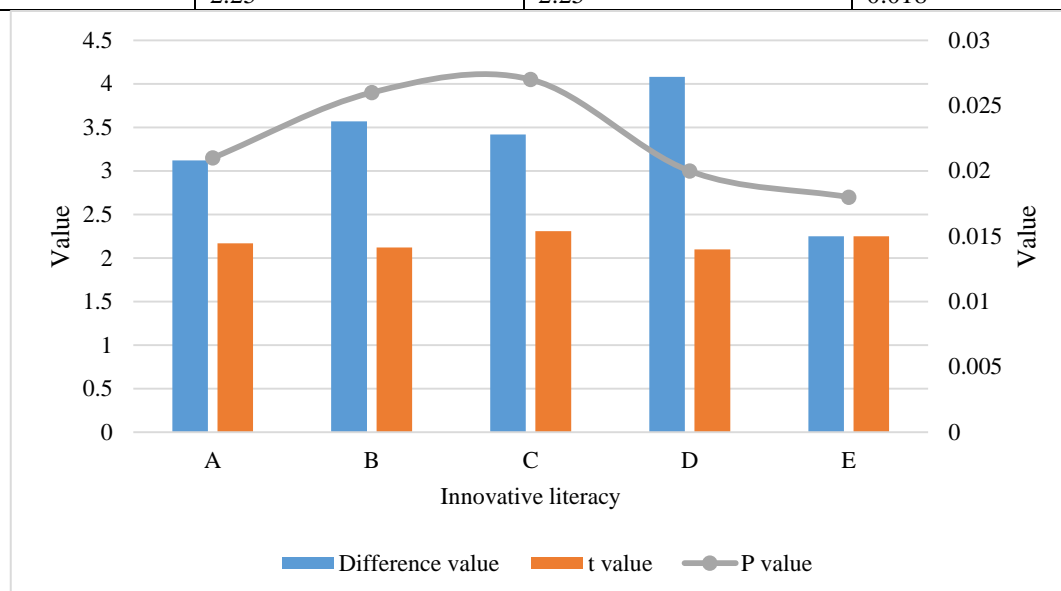|	Difference value	t value	P value
A	3.12	2.17	0.021
B	3.57	2.12	0.026
C	3.42	2.31	0.027
D	4.08	2.10	0.020
E	2.25	2.25	0.018

Figure 4: Statistical results of the experimental class

As shown in Table 2 and Figure 4, P values of all aspects before and after the experiment in the experimental class were <0.05, indicating significant differences, and the scores after the experiment were all higher than those before the experiment, which proved that the teaching method of multiple intelligence teaching had significant effects on cultivating students' innovative core literacy.

As can be seen from the control class before and after the experiment, the P values of all dimensions before and after the experiment in the control class were >0.05, which proved that there was no significant difference. Meanwhile, it proved that there was no significant difference in the core literacy of students.

Before and after the experiment of the experimental class, it can be seen that the P value of each dimension before and after the experiment of the experimental class is <0.05, indicating a significant difference, and the scores after the experiment are all higher than the way before the experiment, which proves that the teaching method of multiple intelligence teaching has a significant effect on cultivating students' core literacy.

After the experiment, after the theory of multiple intelligences teaching, dimensions of the experimental results have a certain degree of increase, and all aspects of the control group increased modestly, the obvious difference, and that in comparative classes and experimental classes of the five dimensions of P values < 0.05, confirmed that there are significant differences, which proves that using the teaching strategy of multiple intelligence teaching can make students' core quality improved significantly.

5. Conclusions

This paper applies the theory of multiple intelligences in junior high school teaching, emphasizing whether the theory can improve the effectiveness of classroom teaching, reduce ineffective output, improve students' academic performance, and enhance students' creativity. In this paper, the multiple intelligences into junior high school chemistry classroom teaching strategy, design a new kind of new teaching mode, as the "correct", feedback the results showed that the new type of teaching cases are based on the traditional junior middle school chemistry teaching, increase the students' interest in learning and physical learning efficiency, but also promote the innovation ability of students. The teaching of junior high school based on the theory of multiple intelligences is effective, which is conducive to the development of students' various intelligences and the improvement of teaching efficiency. Therefore, it is necessary to expand the scope of practice and further study in the future.

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